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TOTAL QUALITY MANAGEMENT: IMPLICATIONS FOR THE NAVY OF THE REPUBLIC OF CHINA

by

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This thesis examines the principles and practices of Total Quality Management. Specific attention is paid to the key points of total quality presented by Dr. Deming, and of those principles and points at work in the US Navy's version of total quality improvement: TQL. Basic and planning tools are explored. Some of the history and results of the US Navy's TQL implementation are discussed. A general proposal is made for implementation of a pilot TQL program on a ROC Navy destroyer command.

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TOTAL QUALITY MANAGEMENT: IMPLICATIONS FOR THE NAVY OF THE REPUBLIC OF CHINA

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This thesis examines the principles and practices of Total Quality Management. Specific attention is paid to the key points of total quality presented by Dr. Deming, and of those principles and points at work in the US Navy's version of total quality improvement: TQL. Basic and planning tools are explored. Some of the history and results of the US Navy's TQL implementation are discussed. A general proposal is made for implementation of a pilot TQL program on a ROC Navy destroyer command.

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I. INTRODUCTION

Management theory in the United States is undergoing revolutionary changes. The new thinking in management has been sparked by the success (and resulting competitive position) of theories applied in Japan since the 1950s. While the leadership of industry in the US was content to practice "business as usual" since the end of World War II, their counterparts in Japan were actively pursuing ways of achieving increased quality, productivity, and market share. This approach to management has come to be known as Total Quality Management (TQM).

The methods at work in Japan, however, owe their existence to work that began in the US in the 1920s. Methods of statistical control then developed were put to use in wartime production during the Second World War. After the war, however, only Japanese industry seemed to be interested in pursuing this new vision.

Later successes in Japan and industrial decline in the US caused US leaders to turn to the "quality gurus"[1]. Resistance from industries in the service sector was encountered early on, as much of the available resources in TQM were focused on manufacturing operations. The view of systems at work in an organization afforded by the TQM approach, however, was soon recognized to be equally applicable to non-manufacturing operations.

The application of TQM theory has spread beyond commercial activity to government and the military. Efforts directed toward total quality in the US Navy, where TQM is known as Total Quality Leadership, began in the early 1980s. Since that time, a wide variety of organizations and commands within the US Navy have attempted to implement quality improvement programs, and to take advantage of the tools and techniques in the TQM arsenal.

In the Republic of China Navy, planning for the future has led to the formulation of the "New Generation Navy" program. As part of this program, the ROC Navy is leasing and building new ships to augment the mainstay of its naval forces: the destroyer

[1] Consultants specializing in the implementation of total quality approaches to management.

fleet. These ships will require the formation of new crew compliments, and present a unique opportunity for the ROC Navy to explore the benefits of a total quality program. Rather than superimposing a new philosophy on well established systems and relationships, the implementation of TQM in a new command will allow for the development of necessary operating systems or processes that embrace the TQM philosophy, thereby diminishing the resistance to change that might otherwise be expected.

While some of the statistical principles upon which TQM depends are currently used in the ROC Navy, there is no knowledge of TQM as a management philosophy. The common TQM tools that are employed are at work without benefit of the underlying principles of TQM. TQM is known in the civilian sector as Total Quality Assurance (TQA), and resources are available.

The purpose of this thesis is to explore the principles and tools involved in Total Quality Management philosophy, to examine the US Navy's implementation of Total Quality Leadership, and to formulate a general proposal for TQM/TQL in the ROC Navy. This thesis is not intended as a comprehensive manual for implementing TQM in the ROC Navy. Rather, it is specifically intended to call TQM to the attention of the ROC Navy leadership, so that the management philosophy may be examined for possible use.

This work is divided into five chapters. Chapter II discusses the operating principles and tools of TQM. The view of TQM presented in this chapter is aided by the approach used by the US Navy in applying Dr. W. Edwards Deming's philosophy of management. Chapter III examines the results of TQL implementation in the US Navy in order to gather "lessons learned" for a possible ROC Navy implementation. Chapter IV presents a general outline of TQM implementation for the ROC Navy, focusing on new destroyer commands being created as part of the Navy's ongoing "Next Generation Navy" program.

II. THE PURSUIT OF TOTAL QUALITY

This chapter explores the world of Total Quality Leadership (TQL). As noted in the first chapter, the TQL/TQM approach to management is revolutionizing the operation of organizations all over the world. While a complete review of TQL theory is beyond the scope of this thesis, the present chapter is intended to provide an introductory view of its aims and techniques. It is hoped that the information provided here will provide motivation for the reader to further explore TQL issues in the wide variety of literature that is available. The first section of the chapter provides background information on the emergence of TQL as a management philosophy. The arrangement of the following sections is modeled on the US Navy's *Fundamentals of Quality Leadership*.[2]

A. BACKGROUND

The system of management that is alternatively known as Total Quality Control (TQC), Total Quality Leadership (TQL), Total Quality Management (TQM), and Total Quality Assurance (TQA) made its first appearance in Japan in the 1950s. Its roots, however, extend even farther back, to the work of Dr. Walter A. Shewhart in the 1920s. Dr. Shewhart is best known for his development of the control charts that today form a vital component of the TQL approach to management.

Dr. Shewhart's accomplishment was to integrate statistical methods with production processes. His theory was that the application of statistical methods in mass production would make possible the most efficient use of raw materials and manufacturing processes and would allow for "the highest economic standards of quality for the manufactured goods used by all of us."[3]

In 1938, Dr. Shewhart was invited to give a series of lectures on the application of statistical methods in process control to the Graduate School of the US Department of Agriculture. His host was Dr. W. Edwards Deming. This series of lectures formed the

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[2] Navy Personnel Research and Development Center, *Fundamentals of Total Quality Leadership*, CIN P-500-0012, November, 1992.

[3] Shewhart, Walter, A., *Statistical Method Viewed from the Viewpoint of Quality Control*, Dover Publications, 1986.

basis for Dr. Shewhart's *Statistical Method from the Viewpoint of Quality Control*, which was published the following year.

Dr. Deming, who traveled to Japan in 1945 as part of General Douglas MacArthur's reconstruction team, continues to be the most widely recognized authority on Total Quality Management. While working on statistical methods to be employed in the Japanese census, Dr. Deming was asked to teach courses on quality control by the Japanese Union of Scientists and Engineers (JUSE).

Prior to and just after the war, Japan had been faced with two key problems: limited resources and difficulty in producing quality products. Dr. Deming's approach to quality was especially important to the Japanese because it focused on reducing cost through quality improvement, which was in turn achieved through the use of statistics. Among the attendees at Mr. Deming's classes at JUSE were many of the Chief Executive Officers (CEOs) of Japanese industry, and Dr. Deming's principles were soon adopted by many Japanese manufacturers. Since that time, the world has witnessed the success of Japanese industry; a small nation with limited resources has become an economic powerhouse.

Dr. Deming himself is modest about his involvement, indicating that the work of the Japanese was based principally on Dr. Shewhart's *Economic Control of Quality of Manufactured Products*, which indicated that productivity improves as variation is reduced, a hypothesis that was borne out by the early work of Japanese manufacturers.[4] Dr. Deming also emphasizes the dramatic achievement of Japanese industry, noting that the nation itself had a negative net worth as late as 1950. Figure 1 shows the "chain reaction" that Dr. Deming notes was "on the blackboard of every meeting with top management in Japan from July, 1950 onward."[5]

This chain reaction starts when the organization focuses on quality. By focusing on quality, productivity is increased, due to less waste in the form of rework, delays, and so forth. When productivity is increased, it is possible for the organization to capture the

[4] Deming, W. Edwards, *Out of the Crisis*, MIT Press, Cambridge, MA, 1986.
[5] Ibid.

market because they can offer a better product at a reduced price. By capturing the market, the organization can continue to operate, and continue to generate employment.

Figure 1. The Quality/Productivity Chain Reaction.[6]

While Japanese industry was moving forward with its total quality approach, industry in the United States continued to rely on producing "satisfactory" products on schedule.[7] By the 1970s, many in the US were beginning to realize that the country's position as economic leader in the world was beginning to deteriorate. As time went on, industry leaders in the US began to look for new perspectives from which to view their

[6] Deming, 1986.
[7] *Fundamentals of Total Quality Leadership*, 1992.

problems and plan for the future. Dr. Deming addressed their problems and potential solutions in his book *Out of the Crisis* in 1982. A synthesizing visual aid for use in describing "The Deming Approach", as his solutions came to be collectively known, is presented in Figure 2.

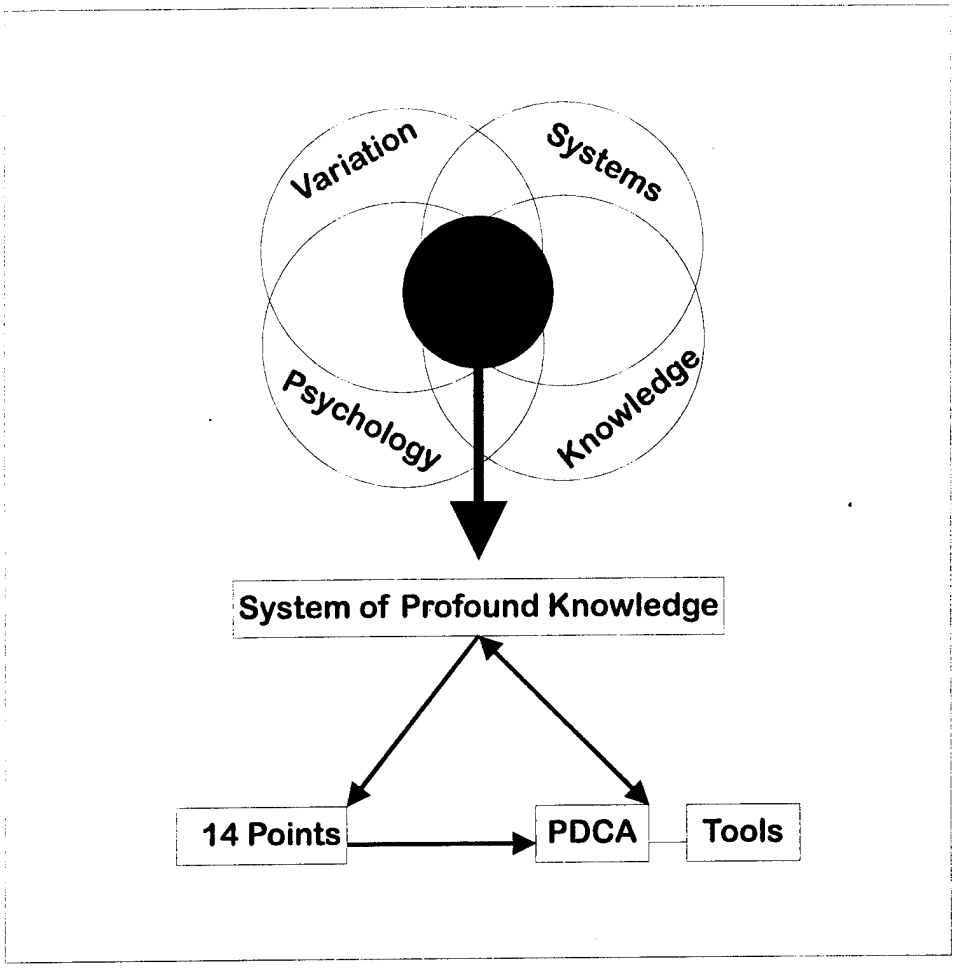

Figure 2. Dr. Deming's Approach to Quality Management.[8]

The diagram in Figure 2 illustrates the components and activities involved in the Deming Approach. Essentially, the approach relies upon a "System of Profound Knowledge" which influences and is influenced by processes and tools that are used in

[8] McConnel, John, *Safer Than a Known Way*, Delaware Books, NSW, Australia, 1991.

applying Dr. Deming's 14 points. The following paragraphs discuss the components of the system of profound knowledge, later sections expand upon the tools, the Plan-Do-Check-Act cycle of continual improvement, and the 14 points themselves.

Systems are at the center of the Deming philosophy. Systems are the mechanisms through which all activity in an organization is accomplished, and are comprised of personnel, machinery, and anything else that interacts within the process at work. It is essential to anyone wishing to explore Dr. Deming's ideas to first recognize that systems are at work all around us.

If one does not appreciate that systems are at work within an organization, there may be a tendency toward fragmentation. This is so because the various individuals involved in the system will "go their own way", without regard for the external and internal influences on the system. These external and internal influences are responsible for the eventual output of the system, and unless management are aware that they exist, and realize how they impact the system, fundamental improvement in the system (and its resulting output) is impossible.

Dr. Deming identifies *common* and *special* causes of **variation**, and specifies that the two types of variation may be distinguished only through the proper use of statistical method. Variation is a natural product of a system, as no system will produce consistently uniform results.

Special causes of variation are those that produce variation that is outside of the statistical control limits on the output of a system. These causes are identifiable, and result from some specific factor or occurrence, which may be removed or marked for close monitoring in the future. Special causes of variation require action, and this action may be taken by the personnel who are actually involved in the process, as well as close supervisory personnel.

Common causes of variation are "causes that are inherent in the process over time, affect everyone working in the process, and affect all outcomes of the process."[9]

[9] *Fundamentals of Quality Leadership*, 1992.

Common causes of variation are a product of the system itself, and the reduction of common variation is a long-term endeavor that requires action by management.

In 1986, Dr. Shewhart's *Statistical Method from the Viewpoint of Quality Control* was republished with a new forward by Dr. Deming, who identifies it as a valuable reference for the statistical methods employed in the pursuit of total quality. Dr. Deming points out again and again in his writings that it is extremely important to have a good understanding of the statistical methods to be employed when examining variation.

Psychology is very important to the total quality approach to management. This is not to say that an organization wishing to pursue total quality should immediately hire a team of psychologists. Instead, management must be aware that psychological considerations play a large role in how the organization performs. The influence of psychology can be found in management's acknowledgment that individuals each learn and adapt differently.

Just as psychological principles are useful in describing societies, so they are useful in describing the culture of an organization. Efforts directed toward total quality are dependent on management's understanding of the characteristics of the culture within the organization.

Knowledge, in Deming's view, is not a single commodity to be absorbed by management at seminars.[10] Rather, it is the gradual accumulation of information about the way in which a given organization, process, or system functions.

According to Deming, management should attempt to gain knowledge through the application of scientific methods. Managers should formulate theories, develop hypothesis, and design and conduct experiments to prove those theories. The application of these procedures is wide-ranging, from, for instance, the determination of optimum operating settings for machinery to the impact of changes in human resource policy on tardiness. Knowledge comes about only after theories and hypothesis are proven.

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[10] Deming, 1986.

B. BASIC TOOLS

This section introduces several of the tools available to managers and personnel engaged in quality improvement efforts. This discussion is by no means exhaustive, and is only intended to indicate to the reader some steps by which to gauge what a system is doing and determine what steps should be taken to improve it.

1. The Flow Chart

In attempting to improve performance in any given process, it is first necessary to know the starting point. The current process must be very well understood to allow for the effect of changes to be noted, and also to identify how the various steps in the process interact with one another. Figure 3 shows the basic structure of a flow chart, in a rather simplified way. Flow charts can grow to be very large and complex for large and complex processes.

As is evident from the figure, flow charts are simple diagrams that show all of the steps of a process and how those steps interact. Flow charts rely on several kinds of symbols to represent common types of activity. For instance, an oval represents either the beginning or end of a process, while a box represents a particular step or activity, diamonds indicate a decision point, and arrows show how the process moves from one step or decision point to the next.

Flow charts may take macro, mini, or micro views, depending on the level of detail necessary for the user to accomplish the task at hand. For instance, a macro flow chart of one's laundry process might involve the following steps:

- Gather and sort laundry
- Put loads into washer
- Put loads into dryer
- Fold and store laundry

By contrast, a micro flow chart might start with these steps:

- Empty the laundry hamper
- Put all white clothes in one pile

- Put all colored clothes in another pile
- and so on ...

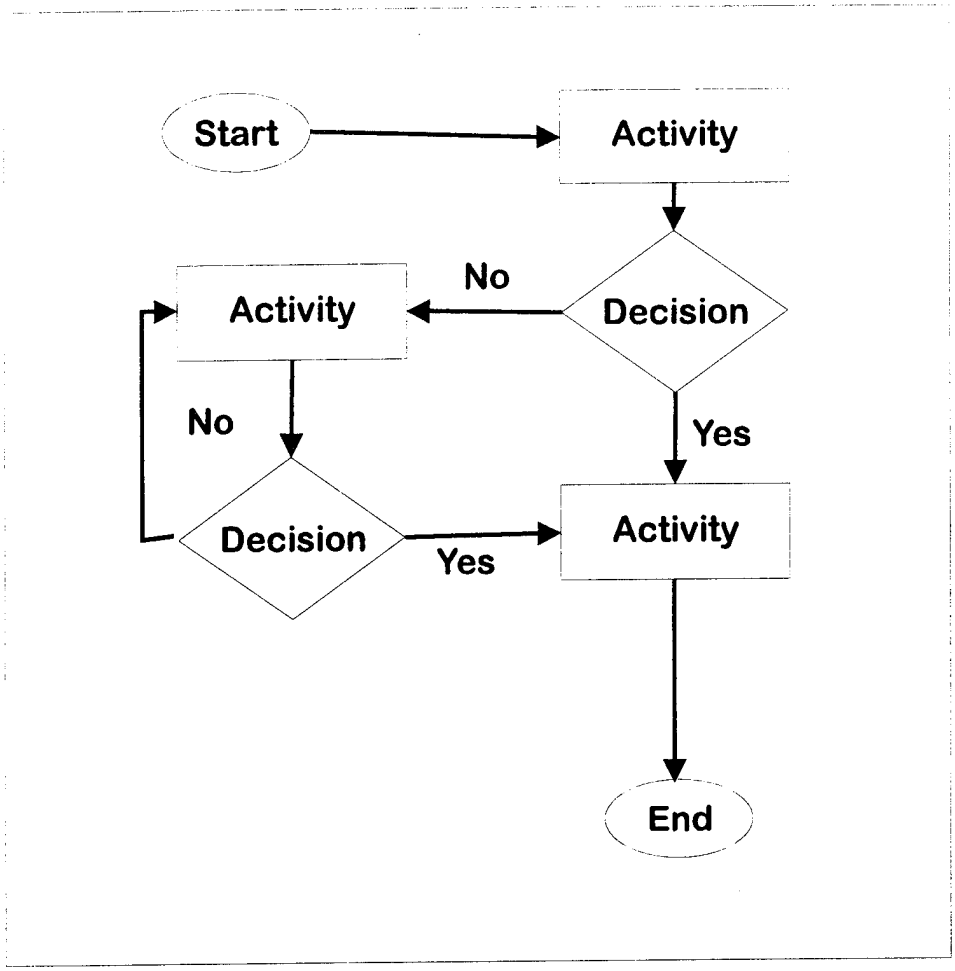

Figure 3. Flow Chart Structure.

The level of detail depicted in a flow chart can vary to provide the user with the most useful view of the process. While a central headquarters might view ongoing operations on a macro flow chart, the commands under that headquarters might utilize mini flow charts that describe their particular involvement in the process, and departments within those commands might utilize micro flow charts to monitor the detailed steps involved at their level.

2. The Check Sheet

Check sheets provide a very simple way to collect and record data. Perhaps one of the easiest to use tools discussed here, check sheets are utilized to record the occurrence of certain happenings. Figure 4 presents two possible structures for check sheet information.

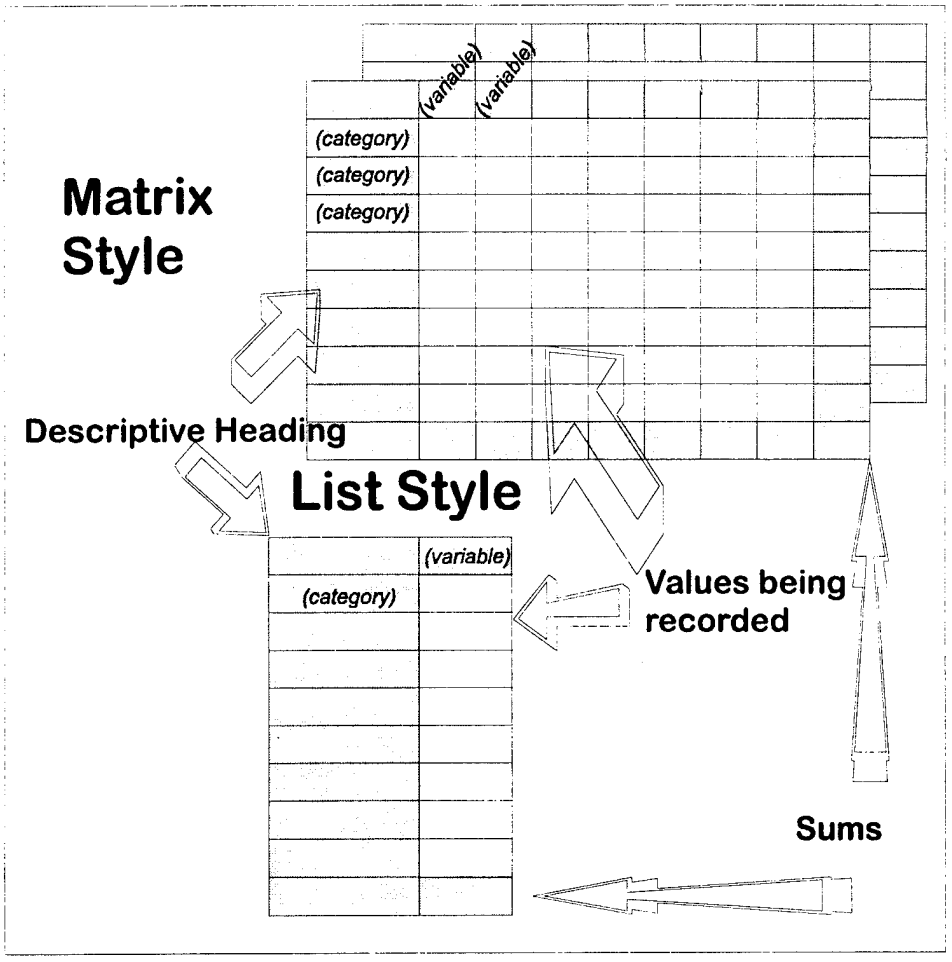

Figure 4. Check Sheet Structure.

The figure shows a "list" styled check sheet and a "matrix" styled check sheet. In both, the columns on the left (shaded gray) are used for descriptive information about the values to be recorded in the sheet. The top row of each may also be used for descriptive

information. The white cells in the both of these sample structures are intended to be filled with the data to be recorded, while the bottom row (and for a matrix, the right column), also shaded, can be used to sum the values on the check sheet, if appropriate to the intended use. This illustration shows a second matrix behind the first, indicating the ability to add dimensions of descriptive information, which can also be done in the simple list structure.

There are two points to be made about the effective use of check sheets. First, everyone who is to use the check sheet should be aware of what exactly is supposed to be monitored. Additionally, the check sheet should be clear and easy to use; there should be no confusion as to what to mark where.

3. The Cause and Effect Diagram

Cause and effect diagrams are alternatively known as Ishikawa Diagrams (after Dr. Kaoru Ishikawa, their inventor) and Fishbone Diagrams (because they resemble the skeleton of a fish). The purpose of these diagrams is to relate possible causes to a specific effect or outcome. It is important to note that the first step in constructing a cause and effect diagram is to identify the effect.

An effect may be a goal or it may be a problem. When the effect is identified, categories of contributing factors are then decided upon, and then broken down into their own components. Simply constructing a cause and effect diagram does not mean that the user has positively identified the specific cause or causes of a given problem; the point of using these diagrams is to provide a view of the process in which the various possible causes of an effect may be seen at work with each other. Figure 5 shows the structure of a cause and effect diagram.

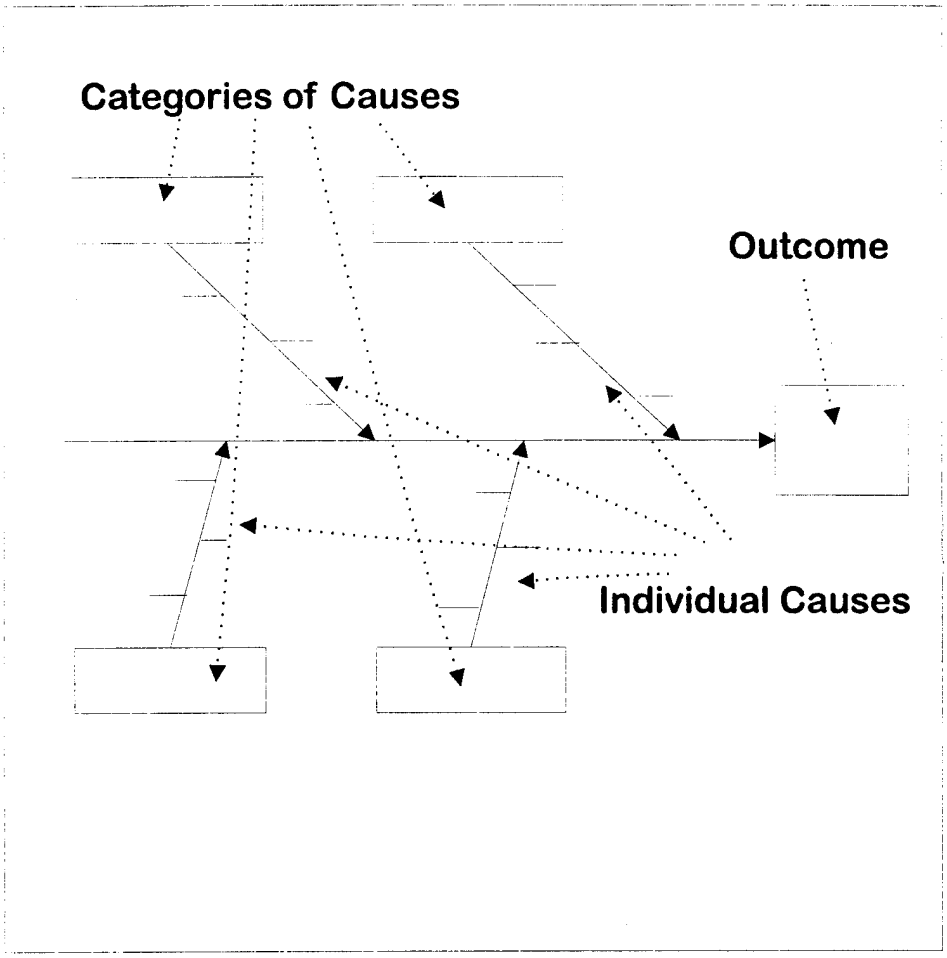

Figure 5. Cause and Effect Diagram Structure.

4. The Pareto Diagram

When multiple influences or categories relating to an effect exist, it is useful to employ a Pareto Diagram to establish which of these is a priority. Pareto Diagrams measure the frequency (cost, yield, etc.,) of a given occurrence across the categories in which that occurrence exists (Figure 6).

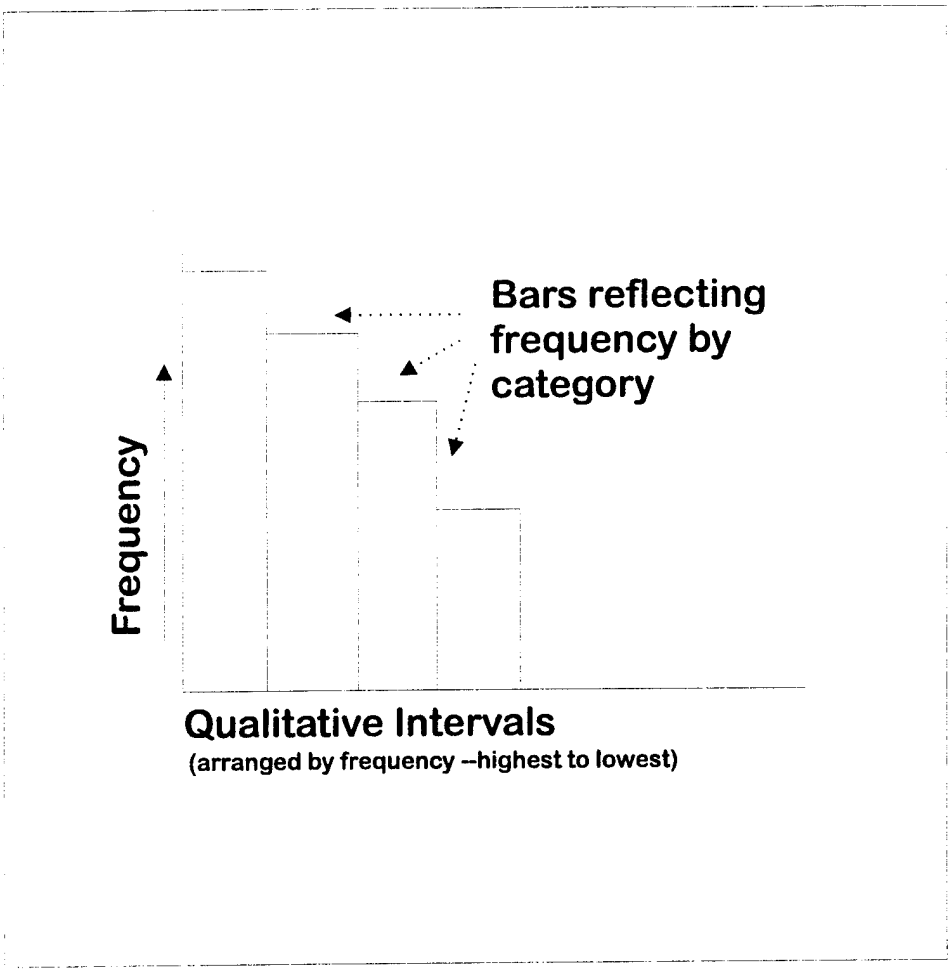

Figure 6. Pareto Chart Structure.

The effectiveness of a Pareto Diagram depends on the insight applied to its use. While frequency of a problem may be great, the consequences of that frequency may vary from minor to major. The y-axis of the Pareto Diagram may also be used to illustrate, for instance, the cost arising from the defects counted, rather than the frequency of the defects themselves.

5. The Histogram

A histogram is a bar chart that shows the distribution of data over range of values. The range of values may be a period of time or any other variable that can be measured,

such as length, weight, and so forth. Histograms are particularly useful in that they provide a graphical depiction of what otherwise might be a large, confusing set of data (Figure 7).

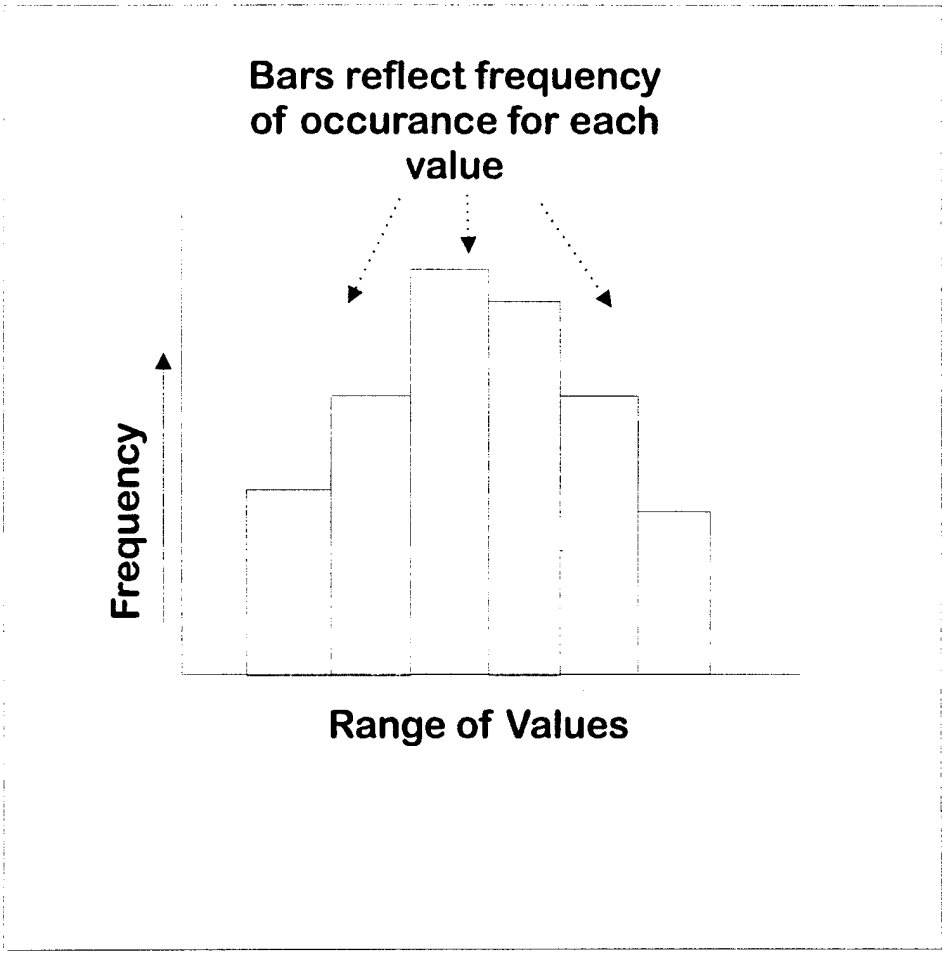

Figure 7. Histogram.

While the Pareto Diagram illustrates frequency of occurences of categories, the histogram shows a distribution of frequency across a range of values. The Histogram illustrates the amount of variation that exists in a given set of data, and can be used to create a distribution curve.

6. The Scatter Diagram

The Scatter Diagram shows the relationship between two variables that have been paired on some basis, and is useful to identify and quantify the relationship between those two variables. This is not to say that a scatter diagram indicates whether or not one variable causes another, but rather to show whether or not the two variables are related in some way (Figure 8).

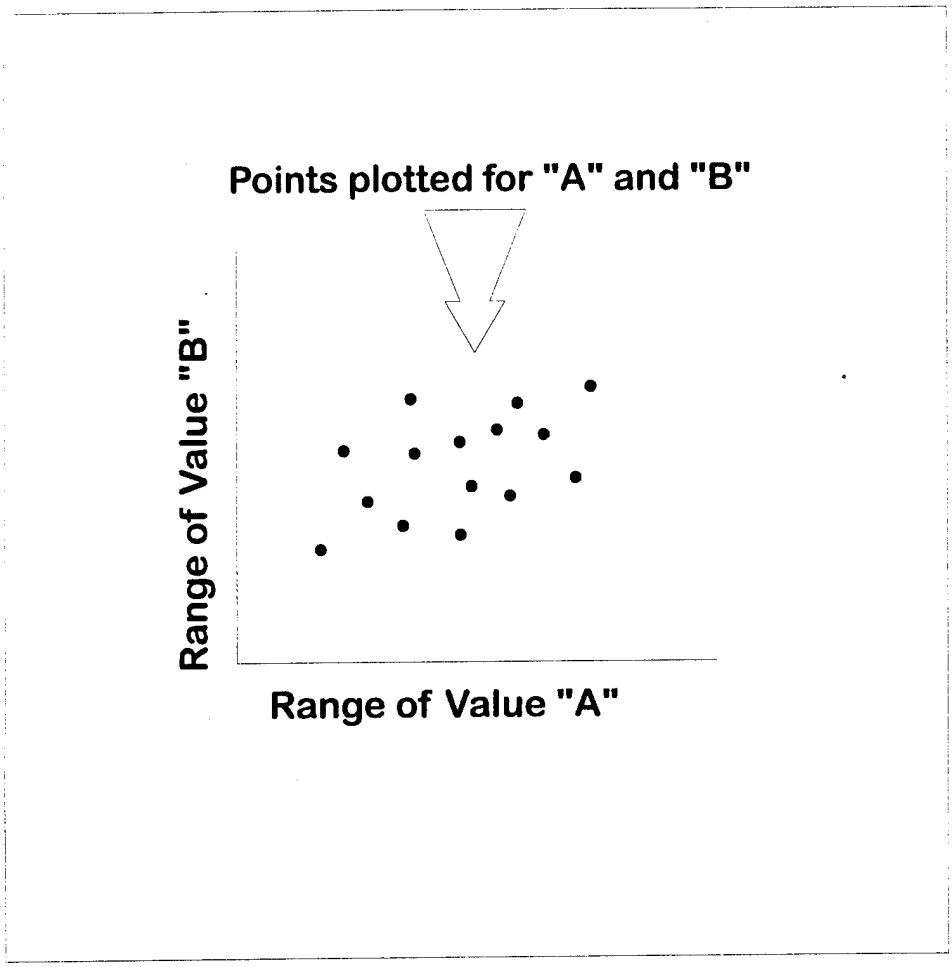

Figure 8. Scatter Diagram.

Scatter diagrams may indicate that two variables are very closely related. This a very useful function, as the variables may be substituted for one another in taking measurements.

7. The Run Chart

The Run Chart is designed to plot a given variable over a period of time. Use of a run chart can reveal the trends, cycles, and other patterns that are at work in a given process. Revealing these trends, cycles, and patterns is important in that they point the direction in which the process is moving, and also because it may be possible for management to relate multiple trends to one another, and determine cause and effect (Figure 9).

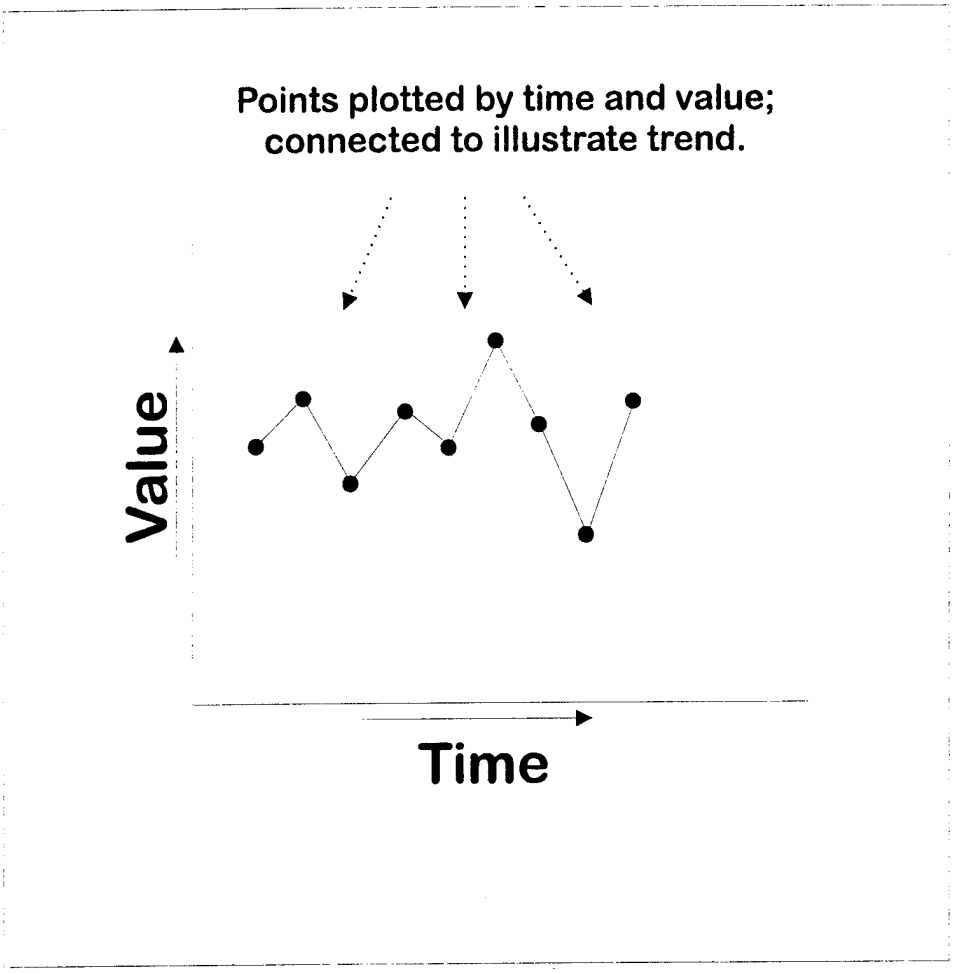

Figure 9. Run Chart.

8. The Control Chart

Control charts can be one of the most powerful tools available in the TQL inventory. Control charts are very similar to run charts, in that they plot values of variables over time. However, control charts incorporate upper and lower control limits to indicate whether recorded variation stems from common or special causes.

A typical control chart will indicate the values recorded as points, the average value recorded as a line near the middle of the range of values, and upper and lower control limits as lines located three standard deviations above and below the average.

Plotted points that lie outside the control limits indicate values that are not within statistical control in the process (Figure 10).

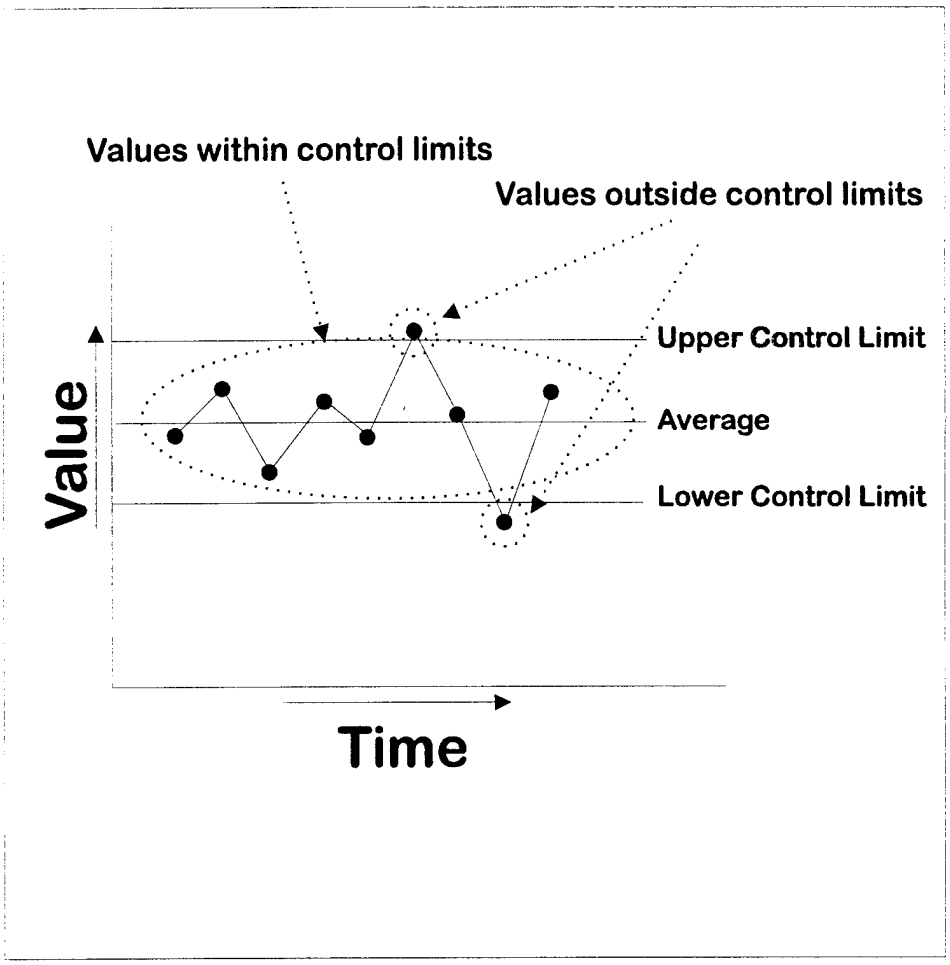

Figure 10. The Control Chart.

C. MANAGEMENT AND PLANNING TOOLS

This section presents a brief discussion of several tools that are useful to management in the planning of improvements to the processes at work within the system. For a detailed explanation of each tool and its use, the reader is referred to *The Memory Jogger Plus*, by Michael Brassard.[11] While the basic tools discussed in the previous

[11] Brassard, Michael, *The Memory Jogger Plus*,Goal/QPC, Methuen, MA, 1989.

section are used to collect and, to some extent, interpret data, the management and planning tools presented in this section are intended to help leaders in formulating and applying knowledge derived from the data.

1. Brainstorming

Brainstorming is the starting point for many activities to be conducted in an organization directed toward total quality. Brainstorming may take place at all levels of the organization, and is the first step at causes and solutions.

In a brainstorming session, the participants and a facilitator gather together and generate ideas in a short period of time. A brainstorming session can be a difficult thing to manage. On one hand, the purpose of the meeting is to come up with things that would not otherwise be considered. On the other, keeping people on the subject at hand in such an environment can be difficult.

There are several ground rules for a brainstorming session. The issue to be "brainstormed" must be specifically identified to all of the group members. All of the group members must be encouraged to actively participate in the session. Criticism of any member's ideas is not to be allowed. As an individual generates an idea, it should be written down. All of the ideas should be visible to the entire group.

These guidelines are intended to provide an environment in which the contributions of each member can be recorded and considered later. It is very important that all group members are comfortable in expressing their ideas as they arise, so that each member's contribution can be applied to the use of the "brainstormed" ideas in later planning.

2. The Affinity Diagram

The affinity diagram is a useful tool to organize ideas, opinions, or issues into groups or categories based upon the natural relationships perceived by the working group. After a brainstorming session, a work group may be left with a wide array of ideas that seem to have no logical relationship. While a brainstorming session is centered around a

specific issue or problem, the resulting ideas require organization to move further in the working groups intended aim. Figure 11 shows the structure of an affinity diagram.

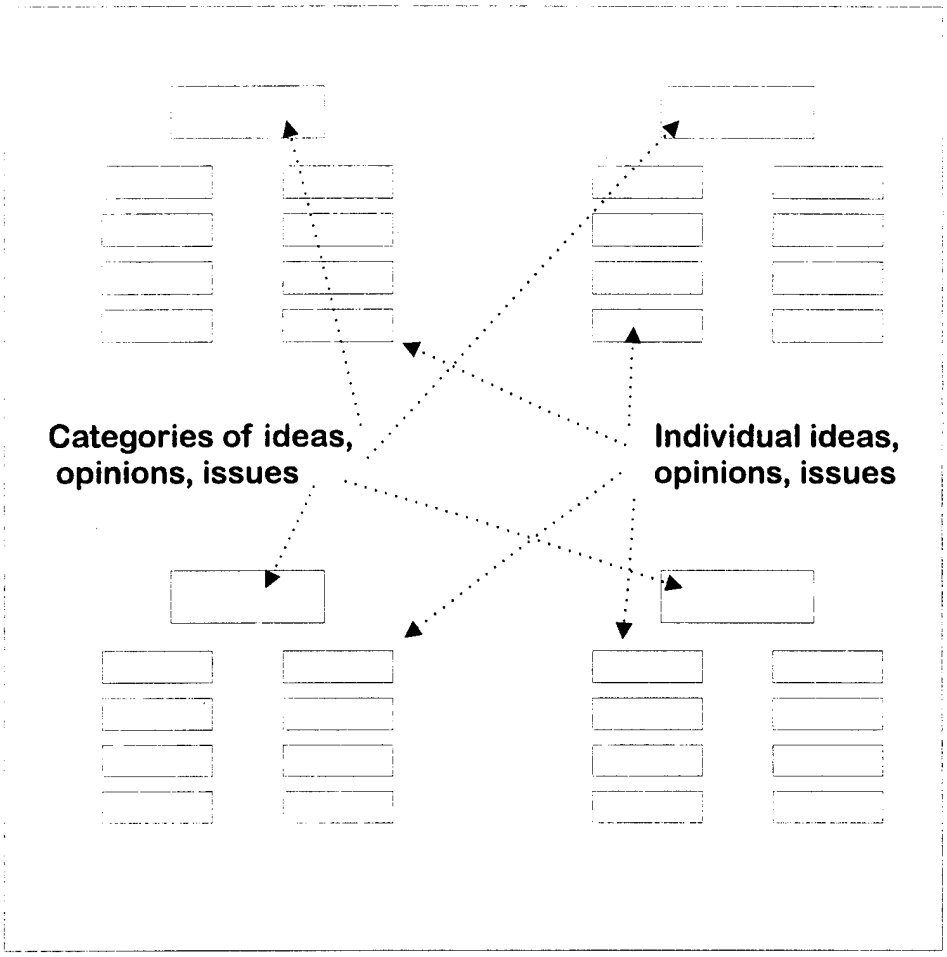

Figure 11. Affinity Diagram Structure.

3. The Relations Diagram

A relations diagram is used to isolate root causes from all of the perceived causes that exert influence on a process. The diagram is started by placing the central issue or problem in a double-lined box in the center of a working board. Each of the issues that exerts an influence on the central issue is then placed in an oval around the box. Issues

that are closely related are placed nearer the box; more remotely related issues are placed at greater distances.

Arrows are drawn, originating at the ovals, toward the box, indicating a causal relationship. Arrows may also be drawn to other ovals, but may only move in one direction between any two objects. The ovals with the most arrows originating from them are designated as root causes by converting them to double-lined ovals. These root causes are the most influential, and thereby the most potentially rewarding, areas for improvement efforts. Figure 12 shows the structure of a relations diagram.

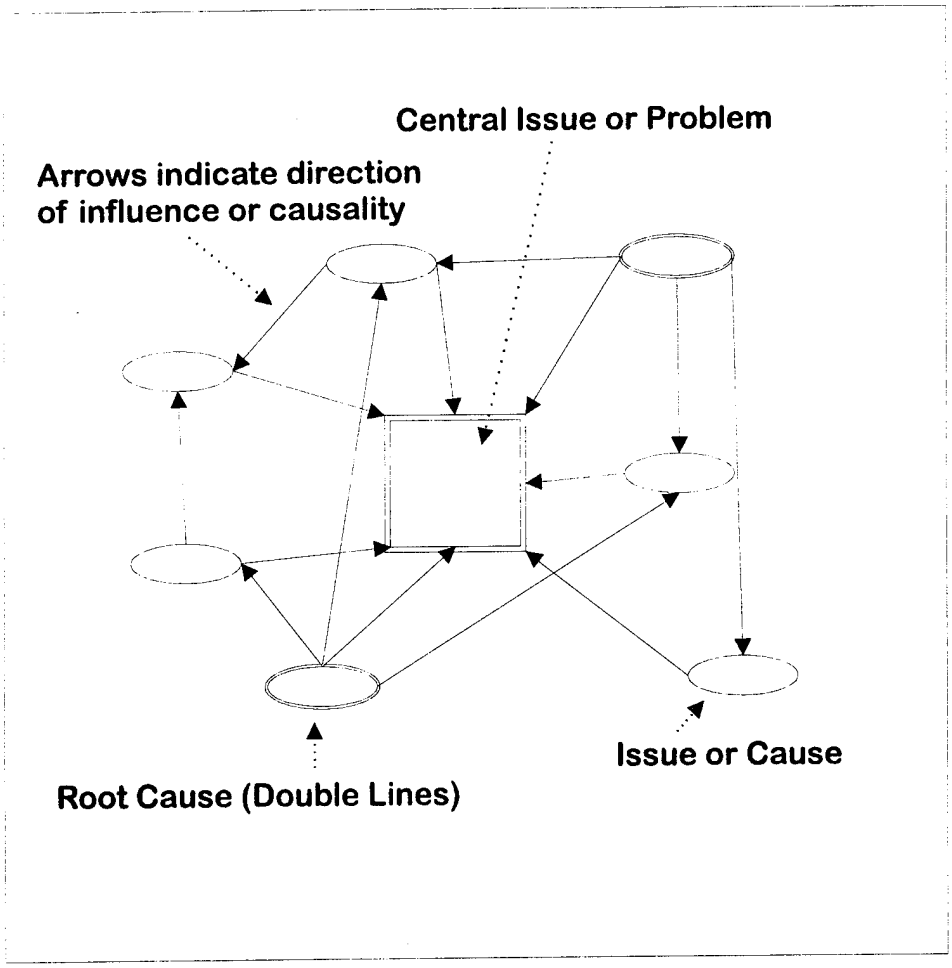

Figure 12. Relations Diagram Structure.

4. The Tree Diagram

A tree diagram identifies the principal goal of a particular process. Secondary, and, if necessary, tertiary and subsequent levels of goals are placed in boxes and attached by lines to the primary goal.

For each of the secondary goals, the individual tasks necessary to complete those goals are enumerated in another layer of boxes. These boxes are connected to the secondary goals by lines, and a secondary goal may have numerous associated tasks. The tree diagram is useful in focusing a workgroup's efforts on identifying subgoals and establishing tasks once a primary goal has been established. Figure 13 shows the structure of a tree diagram.

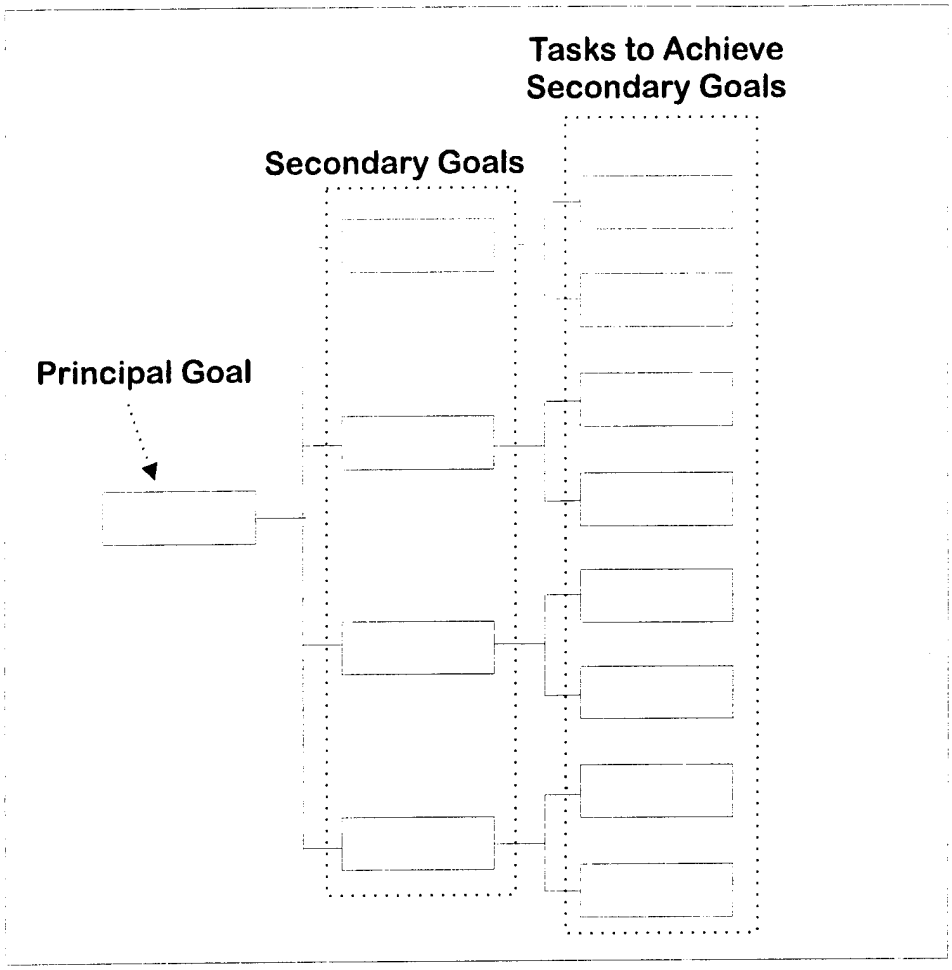

Figure 13. Tree Diagram Structure.

5. The Matrix Diagram

The matrix diagram is used to establish the relationship between two sets of variables. Whereas a scatter plot relates examines the relationship between two variables information or data, the matrix diagram is tailored toward issues. A set of issues is listed in the top row and another in the left column of a matrix. In each intersecting cell in the matrix, the group enters a symbol that reflects the relative strength of the relationship between the two intersecting issues. In some cases, numbers are used in order to weight the strength of the relationship and produce values for further analysis. Figure 14 shows

the structure of a matrix diagram. There are many uses and variations of the matrix diagram, and the reader is encouraged to explore them in further reading.[12]

[12] Ibid.

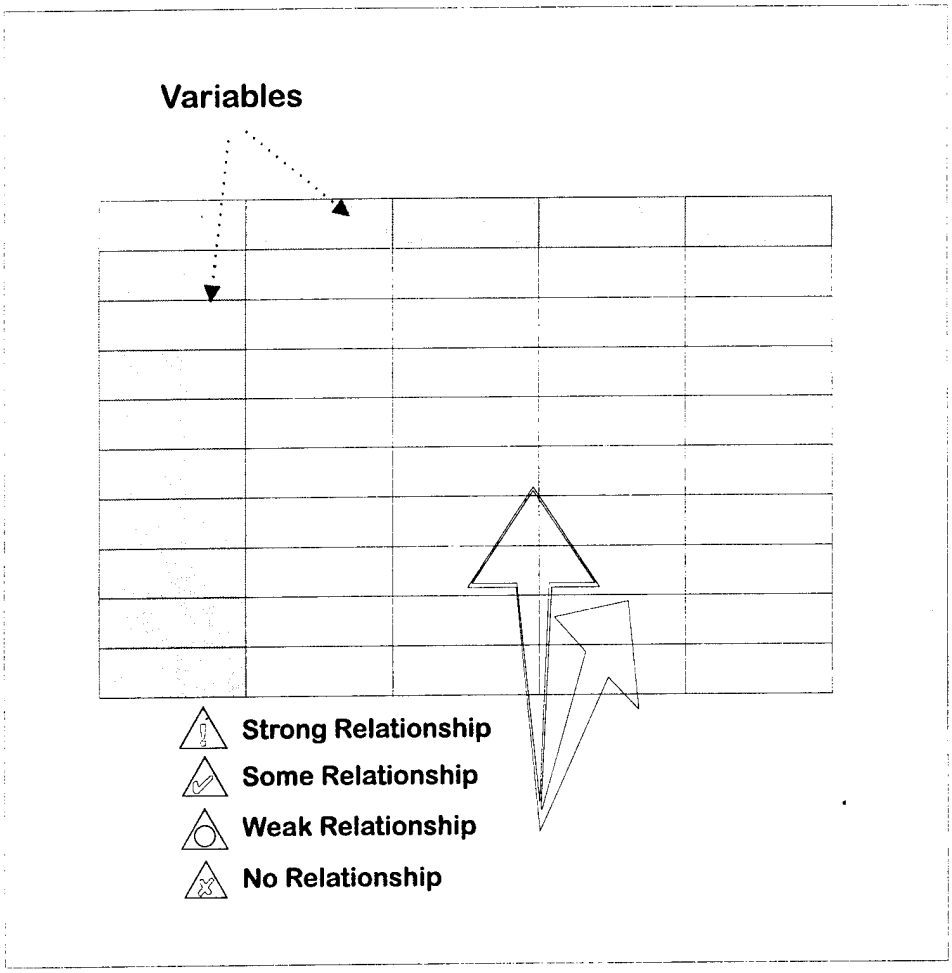

Figure 14. Matrix Diagram Structure.

6. The Prioritization Matrix

A prioritization matrix is an extremely important tool in deciding where to focus improvement efforts. In assembling a prioritization matrix, the team establishes criteria upon which to measure each of several issues. The criteria are then weighted to reflect their relative importance and placed in the top row of a matrix. The left column of the matrix is filled with the issues to be evaluated.

At each intersection point of the matrix, a value is determined to rank each of the variable criteria by level of importance to the specific issue for that row. The value is

multiplied by the weighting for the criteria, and the resulting number is placed in the cell. When all of the cells are filled, the numbers in each row are added together and the resulting total is entered in the far right-hand column. The higher the number in the total column, the higher the priority of that issue. Figure 15 shows the structure of a prioritization matrix.

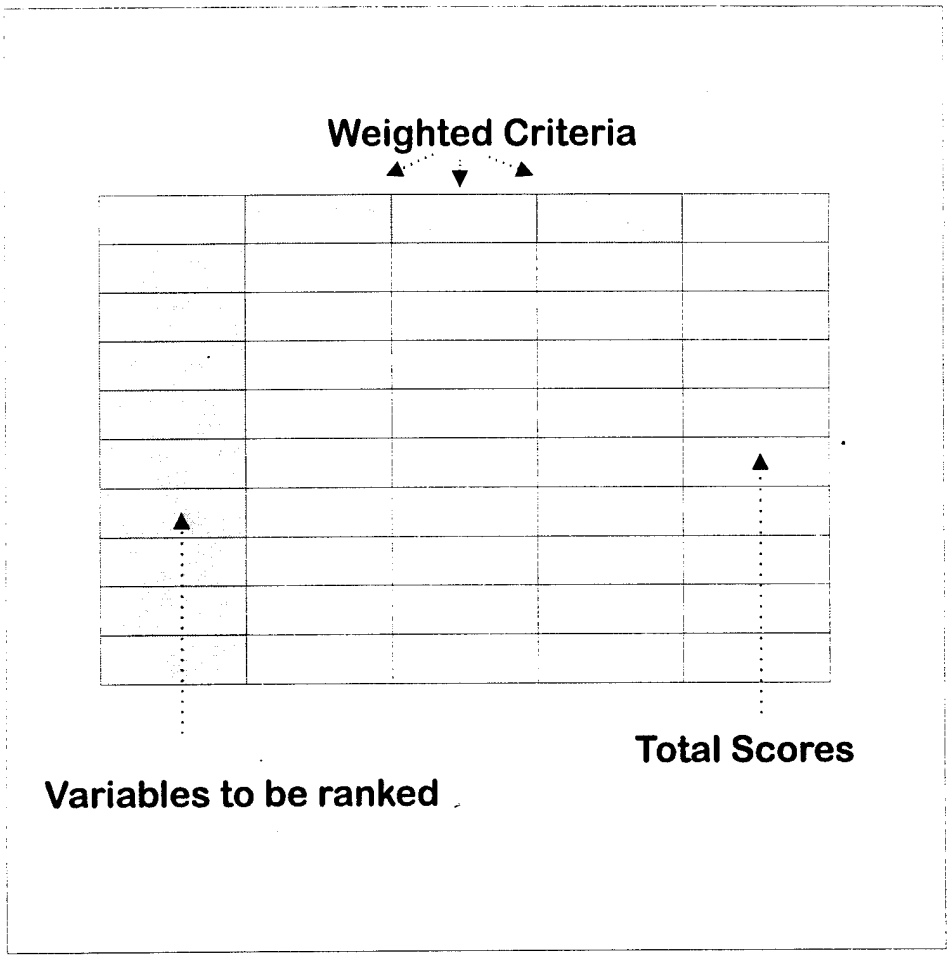

Figure 15. Prioritization Matrix Structure.

7. The Process Decision Program Chart

A Process Decision Program Chart (PDPC) is utilized to anticipate possible problems and identify steps to be taken in the event that they occur. PDPCs are especially useful in planning a new task, whether it will be a continuing process within the organization intended for a unique application.

In building the chart, personnel are able to consider and confront the problems in a plan. Some of these problems may be eliminated immediately, while the potential for others may continue as the process is started, or may be unavoidable.

Preparation of PDPCs allows for comparison of alternative solutions to anticipated problems. Another benefit of the PDPC is that it allows personnel to respond quickly to problems. Even if the specific problem that arises has not been considered in the PDPC, it is possible that the work done in preparing the chart will yield a benefit in developing a solution. Figure 16 is a graphic example of a PDPC.

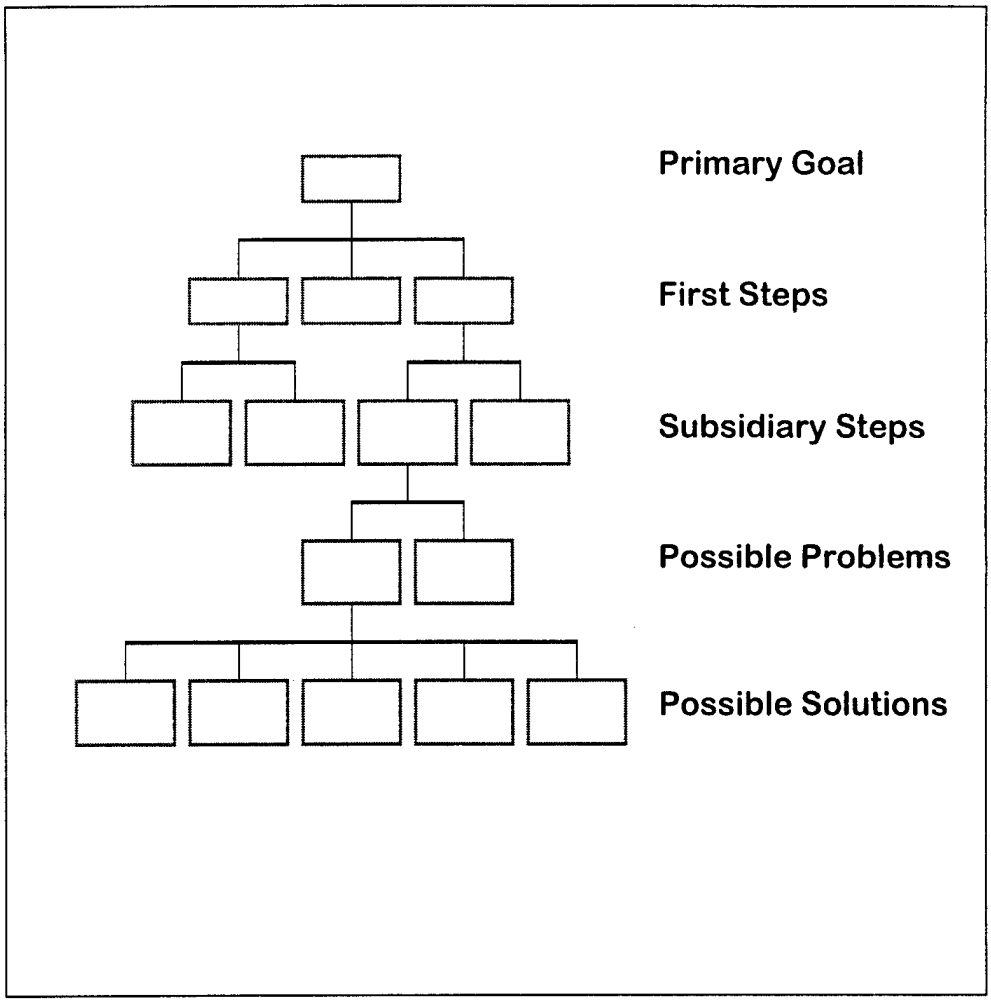

Figure 16. Process Decision Program Chart.

8. The Activity Network Diagram

Activity Network Diagrams (ANDs) are used to chart the progress of steps in a process. ANDs are specifically suited to scheduling functions. They indicate what activities can be done at the same time, indicate scheduling consequences to the process of a problem in a particular activity, and provide a useful tool for decision making in the event that problems occur.

Each of the activities to be performed in a particular process is identified on the arrow between two points in the diagram. The points themselves represent the point

where one activity stops and another begins. The duration of each activity is also placed on the arrow. Activities that may be performed at the same time are placed on the same vertical plane. Figure 17 shows the structure of an activity network diagram.

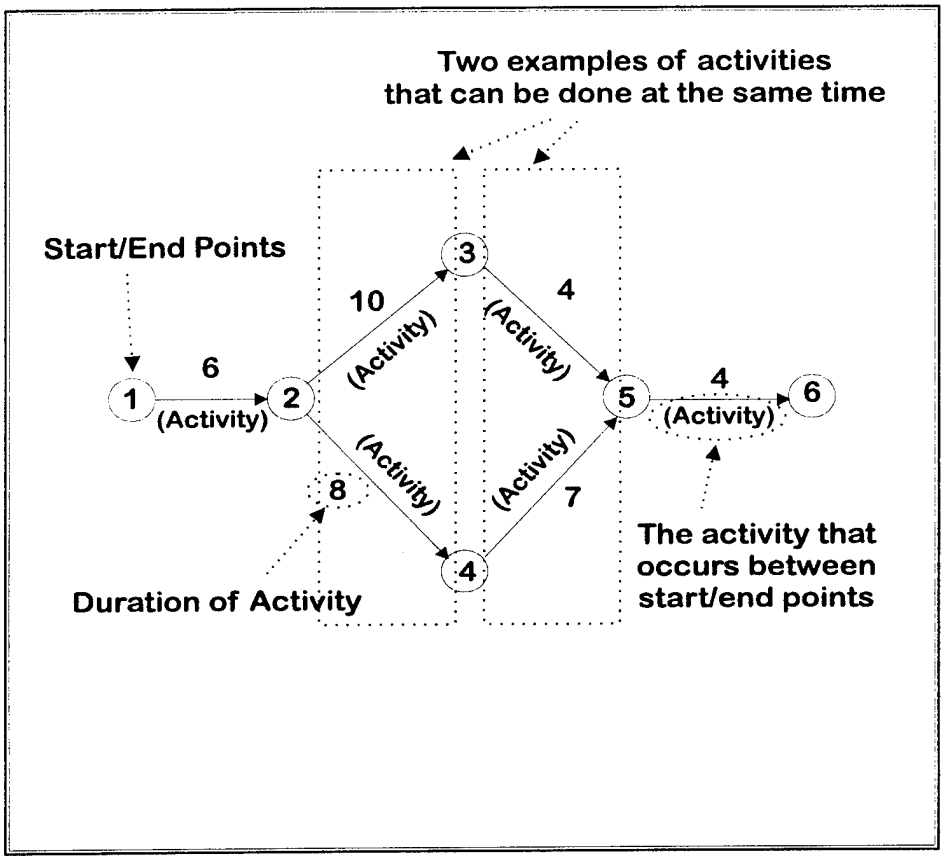

Figure 17. Activity Network Diagram.

D. THE PLAN-DO-CHECK-ACT CYCLE

The Plan-Do-Check-Act Cycle was developed by Dr. Deming during his teaching in Japan in the 1950s. Adapted from the work of Dr. Shewhart (Dr. Deming sometimes refers to it as "The Shewhart Cycle for Learning and Improvement"), it is intended to be used as a "flow diagram for learning and for improvement of a product or process."[13]

The PDCA cycle is composed of four distinct phases:

- **Plan** a change or improvement, preferably on a small scale.
- **Do** implement the plan.
- **Check** study the results of the implemented plan.
- **Act** based upon the results of the plan.

The PDCA cycle is intended to be continuous, and represents a working model of Dr. Deming's emphasis on continual improvement (Figure 18).

[13] Deming, W. Edwards, *The New Economics*, MIT Press, Cambridge, MA, 1993.

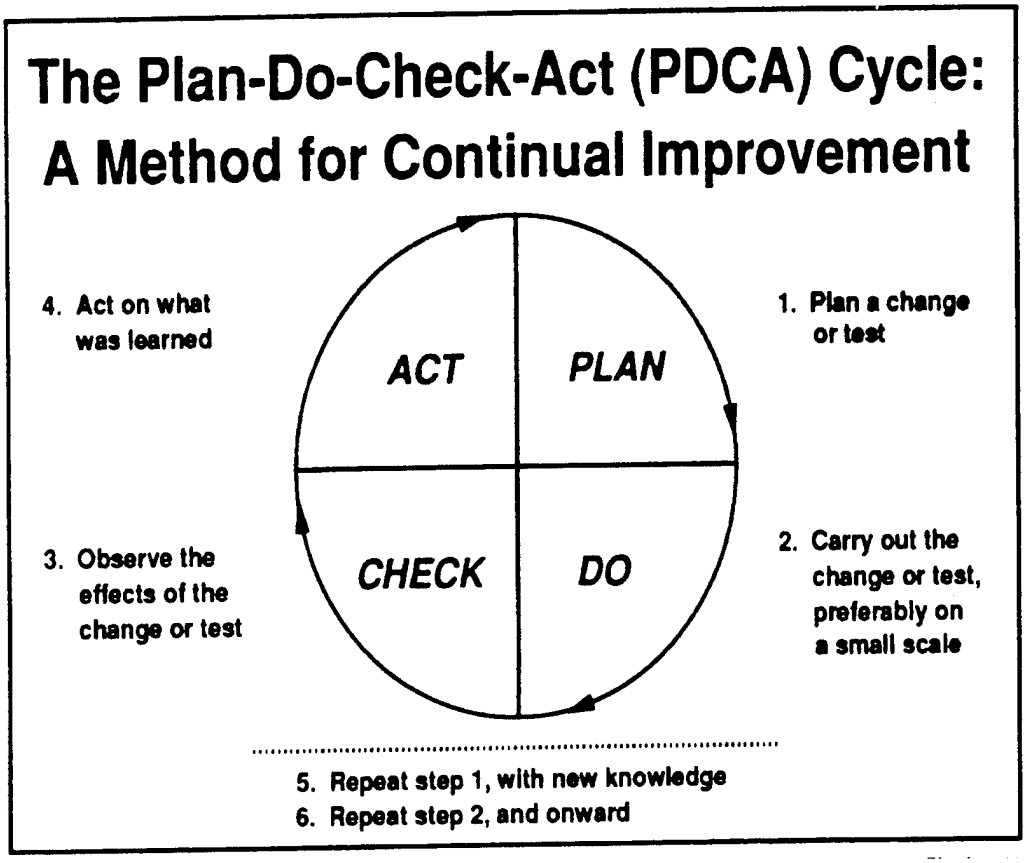

Figure 18. The Plan-Do-Check-Act Cycle Diagram.

E. DR. DEMING'S 14 POINTS

In his book, *Out of the Crisis*, Dr. Deming identifies fourteen key points to be considered in creating a system of profound knowledge. These points are intended to indicate the direction in which management should move to create the environment in which an effort toward total quality may be made.

> "The 14 points are the basis for transformation of American industry. It will not suffice merely to solve problems, big or little. Adoption and action on the 14 points are a signal that the management intend to stay in business and aim to protect investors and jobs."[14]

The 14 "Principles for Transformation", as presented by Dr. Deming in 1986, are:

1. Create constancy of Purpose toward improvement of product and service, with the aim to become competitive and to stay in business, and to provide jobs.
2. Adopt the new philosophy. We are in a new economic age. Western management must awaken to the challenge, must learn their responsibilities, and take on leadership for change.
3. Cease dependence on inspection to achieve quality. Eliminate the need for inspection on a mass basis by building quality into the product in the first place.
4. End the practice of awarding business on the basis of price tag. Instead, minimize total cost. Move toward a single supplier for any one item, on a long-term relationship of loyalty and trust.
5. Improve constantly and forever the system of production and service, to improve quality and productivity, and thus constantly decrease costs.
6. Institute training on the job.
7. Institute leadership. The aim of supervision should be to help people and machines and gadgets to do a better job. Supervision of management is in need of overhaul, as well as supervision of production workers.
8. Drive out fear, so that everyone may work effectively for the company.
9. Break down barriers between departments. People in research, design, sales, and production must work as a team, to foresee problems of production and in use that may be encountered with the product or service.

[14] Deming, 1986.

10. Eliminate slogan, exhortations, and targets for the work force asking for zero defects and new levels of productivity. Such exhortations only create adversarial relationships, as the bulk of the cause of low quality and low productivity belong to the system and thus lie beyond the power of the work force.

11. Eliminate work standards (quotas) on the factory floor. Substitute leadership. b) Eliminate management by objective. Eliminate management by numbers, numerical goals. Substitute leadership.

12. Remove barriers that rob the hourly worker of his right to pride of workmanship. The responsibility of supervisors must be changed from sheer numbers to quality. b) Remove barriers that rob people in management and in engineering of their right to pride of workmanship. This means, *inter alia*, abolishment of the annual or merit rating and of management by objective.

13. Institute a vigorous program of education and self-improvement.

14. Put everybody in the company to work to accomplish the transformation. The transformation is everybody's job.

The counterpoints to these fourteen principles are what Dr. Deming refers to as "Deadly Diseases" and "Diseases and Obstacles" and are as follows:[15]

Deadly Diseases

1. Lack of constancy of purpose.
2. Emphasis on short-term profits, short-term thinking.
3. Evaluation of performance, merit rating, or annual review.
4. Mobility of management; job hopping.
5. Management by use of visible figures only.
6. Excessive medical costs.
7. Excessive costs of liability.

Diseases and Obstacles

1. Search for examples of how to solve problems of quality.
2. Creative accounting.
3. Purchasing standards that assume a certain percentage of defects.
4. Management's delegation of its responsibilities to others.

[15] Suarez, J. Gerald, *Three Experts on Total Quality Management*, Department of the Navy TQL Office, TQLO Pub. No. 92-02, 1992.

7. False starts; modest, ad hoc efforts to bring about change.
8. Hope for instant pudding.
9. The supposition that automation will transform industry.
10. The supposition that it is only necessary to meet specifications.

Dr. Deming's philosophies have become so well identified with the principles of TQM that many refer to this entire method of management as "The Deming Approach." There are other "quality gurus", such as Crosby and Juran[16], but when the US Navy decided to implement TQM in the early 1980s, Dr. Deming's principles were decided upon as the backbone of the Navy program, in large part due to their reliance on the importance of *leadership*. The total quality approach in the US Navy is known as *Total Quality Leadership* (TQL).

[16] Ibid.

III. TQL APPLICATIONS IN THE US NAVY

The purpose of this chapter is to illustrate the approach to Total Quality Leadership (TQL) adopted by the US Navy. The first section of the chapter describes the origins and structures of TQL as practiced by the US Navy. The second section of the chapter relies on case studies to illustrate actual TQL efforts under way. The third section of the chapter highlights key issues that have arisen in migrating the philosophies and methods of TQL in the Navy environment.

A. DEVELOPING A NAVY APPROACH TO TQL

It should be recalled that TQL came about in Japan as the country's industry was attempting to improve productivity with limited resources. The net effect of changes in the world and the domestic priorities of the United States has been to present the military with a similar dilemma. Even prior to the end of the Cold War, however, senior Navy personnel had come to realize that the total quality revolution at work in the civilian sector had similar benefits to offer the military. Moreover, these leaders came to believe that the principles of TQL might offer the only hope of continuing to meet the demands of constituents with the resources that were being made available.

In 1983, the US Navy began its official effort toward achieving Total Quality Leadership. The Department of the Navy TQL program was designed from within, adapting the principles of Total Quality Management (TQM) found in the private sector for the specific use of the Navy. The Navy has defined its TQL approach as:

> The application of quantitative methods and people to assess and improve: materials and services supplied to the organization; all significant processes within the organization; meeting the needs of the end user, now and in the future.[17]

In addressing the implementation of TQL, the Navy has recognized the need to adapt the philosophy itself to the unique mission of Navy organizations, rather than adapting the Navy to TQL. It is certain that the Navy intends a fundamental shift in its methods of

[17] Ibid.

management, but this must be accomplished in a mission critical environment, without degradation of the operational capability of any given organization, command, or unit.

B. QUALITY IMPROVEMENT MECHANISMS IN THE USN

In the US Navy, TQL is "driven from the top." In preparing its own TQL program, the Department of the Navy's Executive Steering Group (ESG) was composed of top military and civilian leaders within the department, and ultimately produced three key documents for the DON TQL implementation: the vision, guiding principles, and strategic goals. These documents were first drafted in an off-site meeting of the senior personnel, working together with TQL experts in a several-day session. This model of implementation has become the standard in TQL implementation throughout the Navy.[18]

It has become Navy practice to make TQL resources available to organizations at all levels. For instance, there is a staffed TQL resource office at CINCPACFLT (the headquarters for the US Navy's Pacific Fleet) that is available to provide resources to any requesting command or organization in the fleet. While commanders are not ordered to implement TQL, the benefits of the new philosophy are widely promoted, and everyone is encouraged to explore TQL principles and develop their own programs.

The Department of the Navy has established its Total Quality Leadership Office to act as a central resource to the Navy for TQL materials and training. This office maintains regional training centers, as well as a presenting special seminars for senior leaders. The office also makes materials and personnel available to organizations that request assistance in establishing TQL programs, and works to provide consistency in applications of TQL principles throughout the Navy.

Central to the US Navy's implementation of TQL has been the theme that well-developed cultural barriers to TQL theory exist in the form of Naval traditions. In confronting these barriers, the Navy has promoted the idea that a "critical mass" of personnel, actively engaged in and benefiting from the application of TQL principles, will

[18] Wasik, J., and Ryan, B., *TQL in the Fleet: From Theory to Practice*, TQLO Pub. No. 93-05, 1993.

be necessary to compel *all* of the organizations within the Navy to adopt the new philosophy. The US Navy accepts the fact that adoption of TQL means cultural change.

In the US Navy, TQL relies on three kinds of teams to get things done: Executive Steering Committees, Quality Management Boards, and Process Action Teams. Executive Steering Committees are concerned with the formulation of strategic quality policy and goals. Process Improvement is the focus of Quality Management Boards. Process Action Teams are responsible for data collection, and are the closest team in proximity to the process itself, working continually to simplify, stabilize, and remove special problems from the process. Direction and resources flow down the hierarchy of teams, while information and recommendations flow up. These teams are supported by the expertise and resources held by a TQL Coordinator. The Navy recommends specific training courses for personnel to serve as TQL Coordinators.

C. US NAVY TQL RESULTS

Several sources of information were relied upon for this section. First, Navy reports and documents describing implementation and results of TQL programs were reviewed. Next, several Naval Postgraduate School theses and class projects concerning TQL were examined. Finally, the author interviewed several active duty Navy personnel involved in implementing TQL in their units.

In 1991, the DON TQL Office was asked by the Chief of Naval Operations to report on how TQL would be applied in the fleet, as opposed to shore-based, operations.[19] To answer the CNO's question, the TQL Office trained 20 military personnel from the aviation, surface, and submarine communities and dispatched them to act as consultants to 11 operational units. After a year's work with the "demonstration units", the TQL Office interviewed the officers. The findings centered around three key observations. First, it was held that the leadership style of the commanding officer and the culture of the organization have a profound effect on the successful initiation of TQL practices. Second, the resource requirements for TQL education, training, and implementation were

[19] Wasik, J. and Ryan, B., *TQL in the Fleet: From Theory to Practice*, DON TQL Office, TQLO Pub. No. 93-05, October, 1993.

not essentially different in shore or fleet based operations. Third, the nature of fleet operations result in a difference with regard to the conduct of TQL training, education, and implementation between shore and fleet based operations.[20]

The aforementioned report contained a testimonial by the commanding officer of the USS *George Washington*, an aircraft carrier being readied for deployment to the fleet at the time of the report, in which he identified several "lessons learned" from the implementation of a TQL program, among them:[21]

- Clarify the relationship of the TQL organization to the chain of command.
- Provide each QMB with a well-defined charter, refresher/just-in-time training, and a quality advisor.
- Get the senior enlisted personnel "on-board" early.
- Select an effective methodology prior to commencing strategic planning.
- Publicize the philosophy, improvement projects, and successes to the crew.
- Don't skimp on indoctrination training.
- Establish a policy on attendance at process improvement team meetings and TQL training sessions.
- Ensure that the TQL philosophy, particularly it focus on processes, is not used as a shield for poor performance by individuals.
- Ensure that the crew understands when the TQL method of decision-making -- through analysis, participation by all concerned, and consensus-building -- is not appropriate.
- Reconsider the appropriateness of the strategic goals as the organization gains experience in implementing TQL.
- Clarify the precepts of TQL theory.

Later in the story, the commanding officer said, "...while the practical impacts [of implementing TQL] have been important, I believe that the cultural effects have been more significant." He also noted that the biggest challenge faced by the crew of the

[20] Suarez, 1992.
[21] Ibid, p. 68.

George Washington was finding the time to work on TQL implementation issues and conduct TQL training when the ship's operational tempo was high.

Nicholls examined the issue of resistance to TQL principles by conducting a survey of Marine Corps personnel of varying ranks at the Marine Corps University in 1991.[22] He found a "general lack of resistance" to TQL among the personnel surveyed, but identified several key areas of specific resistance, depending upon rank. The results of his study indicate that Senior NCOs were reluctant to de-emphasize individual performance reports and unit inspections as part of the total quality improvement process. Officers included in the survey indicated that they were reluctant to involve Senior NCOs in policy-making, value-setting, and the determination of the long-term course of the organization, as well as a reluctance to have enlisted personnel exposed to the methods of quantitative analysis. Additionally, both categories of interviewees, officer and enlisted alike, felt that competition for individual awards increases performance, and that Marine Corps leadership fundamentals were sufficient to see the Marine Corps through any situation prior to the advent of TQL in the Navy.

Several academic studies[23] have focused on the implementation of TQL programs in shore-based, service-oriented organizations, such as supply centers and administrative departments. There seems to be general agreement that the programs have lowered costs and increased productivity. There is also agreement that the key factor involved in these successful implementations has been the level of acceptance of and commitment to TQL principles exhibited by the commanding officer.

Hannes identified several key issues as essential implementation of TQL in the operational fleet.[24] Among these were: commitment of the commanding officer; continual training of ESCs and QMBs; creation of a full-time TQL coordinator; implementing small improvements on a small scale to avoid "false starts"; development

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[22]Nicholls, M.T., "Resistance to Total Quality Leadership Change: An evaulation of Individual Marine Responses to TQL Principles and Change", Master's Thesis, Naval Postgraduate School, Monterey, CA, 1991.

[23] i.e., Caro, 1990; Craft, 1993.

[24] Hannes, K.L., "TQL, A Case Study of Implementation into the Operational Fleet", Master's Thesis, Naval Postgraduate School, Monterey, CA, 1990.

of a professional library to make current literature on TQL available to personnel; adapt TQL to fit the organization, and; creating an on-board culture that fosters innovation.

Rynn conducted surveys of 16 operational and shore-based support TQL implementations in 1992.[25] He found that the operating units were actually using more TQL tools and techniques than were employed in shore-based commands. He also noticed that there seemed to be more resistance to TQL in shore establishment organizations than in the fleet. Rynn suggests that operational commanders are more likely to feel as though they are being monitored by higher authority, and are therefore anxious to support the new philosophy. He also notes that fleet organizations are more likely to accept change because they are conditioned to accept it as part of adapting to the changing mission and circumstances encountered. Finally, Rynn urged that the Department of the Navy assess the Navy's TQL education effort to ensure that there was consistency in approach and content.

In a personal interview, Lt. Sandra Wagner of the *USS Chandler* reported that the greatest barrier to implementing TQL was "convincing people who are set in their ways to change." The principles of TQL have only recently been implemented on this ship, but Lt. Wagner notes that significant improvements in operations have been achieved as a result of streamlining of processes and better communications up and down the chain of command. She is in agreement with many of the other sources of information in noting that the commanding officer is the key to successful implementations, pointing out that the CO of the *Chandler* had set aside a five-day TQL training seminar for the entire crew when the decision was first made to attempt an implementation. Lt. Wagner suggests that it is extremely difficult for a TQL coordinator to function well if their TQL coordination responsibilities are collateral to other duties, and reports that the crew of the *Chandler* is having great difficulty in finding available time for ESC, QMB, and PAT meetings.

Elsewhere, the TQL coordinator has been identified as the key agent of change within the organization.[26] While the consent, support, and active participation of the

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[25] Rynn, Donald P., *Implementing TQL in the Fleet*, Master's Thesis, Naval Postgraduate School, 1993.
[26] Johnston, Larry Wayne, *Implementing TQM at Administrative Detachment BRAVO*, Master's Thesis, Naval Postgraduate School, 1992.

commanding officer of an organization is essential to the implementation of TQL principles, the coordinator's role is perceived by a majority of organizations as critical to successful implementation. The ability of the coordinator to respond to requests for assistance in a timely and informed manner is dependent on the time available to that individual for exclusively TQL-related activity.

In an interview with personnel from the CINCPACFLT TQL Team, several key points were made.[27] First, the point was made that the decision as to when and how to begin a TQL implementation was the organization commander's, and was not imposed on the commander from above, in keeping with the Navy's policy of, as one interviewee put it, "evolution, rather than revolution" in managing the cultural change. Second, the cost savings that could be achieved through quality improvement in all facets of a ship's operations were stressed. In response to questions about TQL increasing the workload for personnel, one officer commented that special efforts are made to discourage organizations from attempting to add another layer of bureaucracy and increase tasks in order to implement TQL. He observed that most of the monitoring statistics and other information that would be necessary in a TQL implementation are already being generated for one reason or other, and that the principal change involved was not "what we're doing", but "how we're doing it."

D. KEY ISSUES

To summarize, there are several issues that have been encountered in the US Navy's efforts to implement TQL. These issues may prove useful in the development of TQL programs and practices in the ROC Navy (Chapter IV).

First, it must be recognized that the traditional US Navy culture may be perceived to be at odds with the new philosophy of TQL. However, as noted in the case of the USS *George Washington*, clarification of the scope and usefulness of TQL, specifically its lack of suitability as operational practice in combat, can help to synthesize a TQL/Navy Tradition approach to operations. While it is entirely inappropriate to form a team to

[27] Interview, CINCPACFLT TQL Team, April, 1995.

make decisions in a combat environment, the formation of a team to examine preparation for the combat environment can be very beneficial.

Second, there is a perception, acknowledged by the Chief of Naval Operations,[28] that implementation of TQL may undermine the chain of command. The CNO's reference to this perception was in the context of denying that it was accurate, and this contention is supported by the commanding officer of the USS *George Washington*, as well as by several of the sources cited in the previous section. Overcoming this perception, and developing the operating practices whereby the chain of command and TQL principles work in aid of one another by, for instance, facilitating communications, is an ongoing issue as the US Navy endeavors to make a "cultural change."

The commitment of the commanding officer to the implementation of TQL has been uniformly referred to as the single most important determinant of success. In addition to the practical considerations generated by the need for resources (personnel, reference materials, and time) which are committed at the commanding officer's discretion, this level of commitment is essential to setting an example for the leadership that TQL is intended to promote.

The US Navy's emphasis on gradual evolution toward TQL, rather than an imposed doctrine, demonstrates the kind of long-term vision found in much of the TQL resource materials. At the same time, time and other resources necessary to carry out TQL activity continue to be problem areas in implementing TQL.

Finally, it is beneficial to again quote the CNO's cover letter to the DON TQL Office report on TQL in the fleet. He makes the point that the resources of Navy tradition and the newer TQL resources have one and the same goal, to ensure that "if we fight, we win".

[28] Cover letter to TQLO 93-05.

IV. POTENTIAL APPLICATION OF TQL PRINCIPLES IN THE ROC NAVY

This chapter examines the potential for applying the principles of Total Quality Leadership (TQL) in the Navy of the Republic of China. The first section of the chapter discusses the culture of the ROC Navy, particularly as it compares with the objectives and principles of TQL. The second section of the chapter contains information on the TQL resources that are available on Taiwan. The third section of the chapter presents suggested steps in implementing TQL in the ROC Navy.

A. ROC NAVY

The ROC Navy is currently developing its *New Generation Navy*, which will incorporate more modern weapons systems and highly trained personnel. One specific area of expansion involves the lease of Knox-Class destroyers from the US Navy. These ships are to be designated as ROC Navy Yang-Class vessels. This presents an opportunity for pilot implementation of TQL programs in new commands that are not yet settled into operational habits and routines.

Based upon the author's experience, there are several potential barriers to TQL implementation in the ROC Navy:

- It is likely that personnel will initially respond by saying that quality "is the responsibility of the quality control department."
- Personnel may also point to recorded indicators of good quality, and maintain that there is no need for a TQL approach.
- TQL implementations may be regarded as increasing already heavy work loads. Further, new responsibilities may be seen as "busy work", rather than as effective methods of management.
- There is a general lack of knowledge regarding TQL in the ROC Navy.
- The operative naval culture relies on delegation of responsibility by command. The commitment and involvement by senior management (in this case,

command) required of TQL in practice may alienate senior officers whose support is essential to an effective implementation.

- Only very limited resources are available to be put to use in a TQL implementation.
- The ships and crews of the ROC Navy have a high operational tempo, fulfilling a variety of missions with limited numbers.

These factors are similar to those noted by the US Navy; indeed, by most of the organizations that attempt a total quality transformation. Part of the challenge and reward of implementing TQL is overcoming these obstacles.

B. TQL RESOURCES

On Taiwan, TQL/TQM philosophy is known as *Total Quality Assurance*. While knowledge of TQL theory is virtually unknown in the Navy, the private sector has been implementing TQA for the past several years. Among the available sources of information in this field are several private consultancies and the government sponsored *China Productivity Center (CPC)*, which publishes documentation on TQA and assembles special instruction teams and curricula for projects at many of Taiwan's companies.

In developing an approach to the implementation of TQL theory, the ROC Navy will be able to work with experts from the CPC. Rather than continuing to send these private consultants to various commands and organizations within the Navy, however, an effort must be made to train naval personnel to teach TQL theory and practice. The Navy will be able to take advantage of CPC personnel in developing TQL policy and in evaluating TQL implementations.

By identifying customers and defining their needs, it is possible to tap into the largest TQL resource available to any organization: its personnel.

C. IMPLEMENTATION

1. General ROC Navy Considerations

As noted above, the formation of new destroyer commands presents a unique opportunity for the implementation of TQL programs in the ROC Navy. The purpose of this section is to explore ways to take advantage of that opportunity. While it may prove impractical to implement pilot programs on several ships at once, it may be beneficial to let pilot programs be initiated as each of the new destroyers comes on line. There will be three destroyers added to the fleet in 1995, and another six over the following few years.

It must first be noted, however, that any implementation of TQL in a command within the ROC Navy should be implemented concurrent with adoption of the philosophy in the Naval Headquarters. While the extent and schedule for such an implementation at higher levels of command is beyond the scope of the present work, it is possible to outline the basic steps to be taken.

As was done in the US Navy, the ROC Navy should take steps to make the new philosophy its own. This can be done by drawing upon existing *TQA* resources on Taiwan, specifically the China Productivity Center in Taipei. The leadership of the Navy should work together with civilian consultants to develop an approach to TQL that is harmonious to the existing culture and operations of the Navy, where possible, and to formulate approaches to changing these facets of Naval operations as necessary.

While this central effort will produce a program that is tailored to the operations at Navy Headquarters, the resulting decisions will set precedents to be followed in implementing TQL throughout the Navy. If the Navy Headquarters program is implemented at the same time that an approach is developed within a new destroyer command, it is possible that each process will benefit from the other. Indeed, concurrent pilot TQL programs "in the fleet" and at administrative commands may yield significant benefits at the point when the program is fully developed and to be implemented Navy-wide.

2. Destroyer Pilot Program -- First Steps

Whether the destroyer pilot program occurs simultaneous to, as a result of, or as a precursor to the implementation of a TQL program at Naval Headquarters, the basic course of implementation will involve the same general elements. In keeping with the lessons learned from TQL implementations in the US Navy, there are key initial steps that will enhance the likelihood of the program's success.

First, the commitment of the commanding officer of the destroyer will have to be obtained. This commitment cannot be honestly made until the commanding officer has at least a basic understanding of TQL theory and practice. US Navy commanders benefit from the availability of senior leadership seminars that are open to any command-level officers who are interested in implementing a program and can schedule time to attend. The lack of this resource within the ROC Navy does not eliminate the need, so certain personnel will have to rely on comparable civilian resources to meet this requirement.

Once the destroyer on which the program is to be implemented is identified, the commanding officer, the executive officer, and the department heads should all attend a total quality improvement course. This course may be presented by the civilian China Productivity Center, but should be prepared in advance with the assistance of training personnel from Naval Headquarters. The involvement of training personnel in the preparation of the course will help to provide the starting point for a ROC Navy version of total quality improvement theory, and should yield a reduction in the "cultural shock" that might otherwise be anticipated on implementation.

Additionally, the key leaders sent for training should be accompanied by an officer who will function as the destroyer's TQL Coordinator. This is something new for the ROC Navy operations. Having a TQL Coordinator in the latter environment might cause some initial conflict among officers of the ship -- seeing the TQL Coordinator as not being a direct part of crucial operations. However, the TQL Coordinator is expected to spread the knowledge, implementation of teams, and importance of TQL throughout the ship.

At the conclusion of the leadership training, the key leaders should be allowed undisturbed working time to prepare a clear and informative vision statement, operating principles, and goals to achieve the vision.

3. Destroyer Pilot Program -- Orienting Personnel

Before the actual work of building teams and addressing problems commences, and as close to the arrival of all personnel as possible, there should be a general training session for the entire crew.

During this session, the vision, principles, and goals developed by the leadership can be communicated to the crew. Additionally, the crew can receive general training in the fundamentals of TQL.

4. Destroyer Pilot Program -- Building Teams

After the initial training session, the time will have come to form the teams that have proven so useful in implementing TQL in the US Navy. The Executive Steering Committee will probably closely resemble the group of officers sent to the training seminar. Quality Management Boards will most likely be formed for each department, with additional QMBs formed to address key issues that stretch across departmental barriers. Process Action Teams may then be created to form the "front line" of the quality improvement effort.

The organization and training of these teams will certainly take some time. Consideration of the pilot program implementation by senior planners in Naval Headquarters will be useful in adjusting the commissioning schedule and operational requirements for the new command so that at least the structure of the teams may be established before operational pressures exert too great an influence.

Initial TQL team training will focus on the purpose of TQL, as well as communicating the vision, rinciples, and strategies determined by the leadership. Additionally, this initial training will provide orientation to key TQL terms and relationships, such as the concept of internal and external customers. Subsequent team

training wil explore the tools and processes, such as brain storming, variable identification, trend analysis, and so on.

There are many ways in which the tools discussed in Chapter II can be employed by the pilot organization. One of the key principles of TQL is that the members of the organization focus on key issues identified by specific teams within the organization. At the risk of predetermining the areas of focus, it is possible to suggest several initial focus areas. First, because a pilot program ship will still be in the process of installing systems and accepting crew, a TQL approach could be taken to optimize these processes. For instance, the process for an individual to be accepted into the crew will include many personnel forms, meetings to impart information, and so on. The first Quality Management Boards (QMB) and Process Action Teams (PAT) could address the optimization of this process, and similar teams could be formed to handle installation of systems and equipment and stocking of provisions.

Other areas to be addressed will include the various real-time operational processes at work on the ship. For instance, the engineering section will need to begin gathering and interpreting data on performance characteristics of the ship's propulsion systems. By tracking variables such as run-time, temperature, maximum revolutions, and so forth, the section should be able to develop milestones for a maintenance program that will keep the ship's propulsion systems at optimum performance levels over time. Other areas for improvement might include the ship's weapons systems and the response time required to meet a given threat, or an accident team that works toward reducing the number of mishaps occuring on board. Because of the high operational tempo of the ROC Navy destroyer fleet, activities directed at reducing the overall "downtime" of the ships will take precedence.

5. Destroyer Pilot Program -- Continuing Education

Once the teams are in place, the real work toward quality improvement may begin. This cannot be an end, however; perhaps only the end of the beginning. The TQL Coordinator will have to work to make resources available to the teams, and will have to

constantly move from one team to another, facilitating discussion and development of ideas, and furthering the education of the crew in the principles of TQL.

6. Evaluation

TQL Coordinator would evaluate his/her respective ship to provide a profile of critical areas based on TQL data collection and analysis. In addition, it is assumed that Naval Headquarters will monitor the progress of the TQL implementation on the destroyer, as well as its comparative performance. Over time, however, it is hoped that the benefits of TQL will evidence themselves on board the pilot program command to the point where the Navy leadership decides to make TQL resources available to the entire Navy. It will also be advisable to have civilian total quality improvement experts periodically visit the command, in order to verify the integrity of the TQL processes at work within it, and to expand their knowledge base of TQL in a military setting so that this enhanced resource is available in the future. The pilot program should be useful in establishing a database on performance statistics for evaluation by senior personnel and for the continuing development of operational practices and measures.

V. CONCLUSION

This chapter presents the findings of research conducted for this thesis. The first section notes the aspects of TQL that make it desirable for implementation. The second section contains observations regarding TQL as practiced by the US Navy. The third section of the chapter reiterates the key points to be recalled in developing a TQL approach for the ROC Navy.

A. TOTAL QUALITY

Increasing competition for resources and markets is propelling a world-wide shift in management thinking. Vast corporations and small firms alike are implementing principles of total quality to re-orient the processes at work in their organizations toward providing quality to customers.

A key point in implementing TQM in a military organization is the provision for both external and internal customers. This means that, beyond the legislative and public constituencies served by the military, each process at work within the establishment itself is devoted to meeting the needs of the next process in line. In this way, every command and department, each section and team, may be committed to continual improvement, and can communicate with one another to effect positive change.

B. US NAVY TQL

Chapter III examined the US Navy's implementation of its own version of TQM: Total Quality Leadership. Through research and interviews, several key issues were identified regarding the progress of this effort.

It has been acknowledged by many organizations and individuals within the Navy that the basic Navy culture may be perceived to be at odds with the objectives of TQL. Specific problems have arisen as a result of TQL's reliance on input from lower levels of the organization, its prohibitions about merit rating and reward, and the emphasis on statistical control rather than complete inspection.

A significant step was taken toward overcoming these cultural barriers when the Navy approached total quality improvement by "making it its own." The adjustment of TQL principles to fit the organization is acceptable practice to the philosophy, and essential to the Navy's formula for developing total quality. As the Navy works toward attaining its "critical mass", operating policy with regard to the new philosophy is being continually refined.

More practical barriers still exist, however. Specifically, the time required for personnel to establish and participate in the Executive Steering Committees, Quality Management Boards, and Process Action Teams can be cause for significant delays and frustrations in implementing the new philosophy.

C. POTENTIAL TQL IMPLEMENTATION IN ROC NAVY

The principles of Total Quality Leadership as practiced in the US Navy present a significant opportunity to the Navy of the Republic of China. While total quality improvement is unknown as a management philosophy in the ROC Navy, recent years have seen the evolution of many "Western-Style" operating techniques in ROC Navy practices. The US Navy, in particular, has long been a source of inspiration to the ROC Navy, for instance, in the areas of maintenance and procurement procedures.

The US Navy has begun to see the results of a Navy Tradition/TQM integration. These results give the leadership of the US Navy every reason to continue the effort. These same results are achievable in the ROC Navy, but will require the same level of commitment, from the top down.

The creation of new commands in the ROC Navy destroyer fleet presents a unique opportunity for the ROC Navy to evaluate TQL for implementation. The cost of early transfers to a new command and the additional training required in TQL concepts is negligible, given the prospects for successful development and implementation of specific methods of operations. The impact of additional activity on an already high operational tempo is potentially significant, but the potential reward for establishing a

method of increasing productivity through improving quality is more than enough enticement to proceed.

The fundamental question to be addressed in deciding whether or not to proceed with the pilot program and, indeed, at the conclusion of the pilot program with regard to expanding the new philosophy Navy-wide, is whether or not the principles of TQL can be absorbed by the ROC Navy culture, and whether any organizational stress incurred by such a move is offset by resulting improvements. In answering this question, one may look not only at the results of TQL in the US Navy, but at the reasons why it was initially implemented.

The ROC Navy is experiencing the same kind of pressures that the US Navy is experiencing. Demands on existing resources are increasing, and policy makers are in the process of reducing the growth of resources to be allocated in the future. This is a simple equation that requires increased *productivity* from the organization. The aim of total quality improvement is to increase productivity.

The US Navy has managed to incorporate the principles of TQL without damaging the authority of the chain of command, proving that it is possible to draw firm lines between activities that benefit from the exchange of ideas and team-based approach to process improvement, and activities that draw upon the more traditional Navy cultural values of authority, respect, and obedience. The same environmental pressures that have compelled many organizations in the civilian sector to evolve their organizational strategies and operating procedures are driving military organizations to do the same. One requirement of this kind of change is for leaders to recognize the limitations of current practices and identify ways to cope with the changing situation.

While the pilot program described in this thesis may, in the end, indicate fundamental problems with integrating TQL into the ROC Navy, it seems highly unlikely that the Navy leadership will find *nothing* of value to adopt from the new philosophy. On the other hand, elimination of some or all of the principles of TQL from consideration will at least cause the ROC Navy to look in other directions to meet the challenges of the present and the future. One thing remains clear, however: "Business as usual" will not

equip the ROC Navy for those challenges; organizational leadership and practices must evolve to be effective.

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